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The Evolution of User Satisfaction
as a Surrogate Measure of
Information System Effectiveness

by

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ABSTRACT

With information technology being "the largest line item in Corporate America's capital spending budget ... companies need to develop better ways of measuring office productivity and the contribution that managers and other white-collar workers make to the bottom line." This thesis reviews the MIS literature over the last 20 years dealing with measuring information system (IS) effectiveness. In particular it tracks the genesis and evolution of user satisfaction as a surrogate measure of system effectiveness. The concern is whether the surrogate, user satisfaction, an opinion is the same effectiveness, the behavior, an action. It was found that an instrument for measuring user satisfaction developed by Bailey and Pearson (1983) has been widely accepted and used by the MIS community for measuring IS effectiveness. However, it was also found that many studies failed to consider any other methods of measuring effectiveness and many also misapplied the instrument as well.

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I. INTRODUCTION

A. BACKGROUND

"The Puny Payoff from Office Computers." That was the cover story for Fortune Magazine 26 May 1986. Why is this? The computer age was to bring increases in white-collar productivity as earlier generations of technological innovation did for other sectors, e.g. farming and manufacturing. So far, business investment of hundreds of billions of dollars in computer systems has failed to significantly improve productivity. There has been little or no change in white-collar productivity since the sixties, where 85-90 percent of information technology is invested (*Fortune* 26 May 1986). Combined with the fact that "information technology is now the largest line item in Corporate America's capital spending budget ... Companies need to develop better ways of measuring office productivity and the contribution that managers and other white-collar workers make to the bottom line." (*Business Week*, 26 November 1990)

B. OBJECTIVES

Evaluation of information systems is necessary to effectively manage them as organizational resources. To do this an organization must be able to measure the costs and benefits related to its systems. This allows decisions on

design and implementation to "be made in the same way as every other firm investment decision, i.e. based on its contribution to the success of the firm." (Marsden and Pingrey, 1988)

Various evaluation methods have been used to assess information system effectiveness. The one of special interest for this thesis is user satisfaction. A number of articles in IS literature cite user satisfaction as a surrogate for effectiveness (Ives, Olson and Baroudi, 1983; Pearson, 1977; Seward, 1975; Hamilton and Chervany, 1981). The desire for a surrogate stems from the fact that unlike transaction processing systems, data on IS use provides little information on the effectiveness of the white collar world. The issue here is whether opinions about a system such as user satisfaction, are the same thing as effectiveness of a system. MIS is a multidisciplinary field spanning technical sciences, management science, psychology and other social sciences. Problems can arise when techniques, theories or results from a study in one field are used in another. Management science has had difficulty in establishing a link between satisfaction and productivity. This thesis will review the MIS literature that attempts to show a relationship between user satisfaction and system effectiveness. It will examine the development of this relationship in the MIS literature. Specifically, it will seek answers to the following questions:

1. Is user satisfaction a useful measurement of IS effectiveness?

2. What are the various meanings of user satisfaction in IS literature?
3. Does the IS literature now assume that measuring user satisfaction is equivalent to measuring effectiveness for IS, if so, does it reference previous literature?
4. Are other methods used to measure effectiveness? What are they? Does the author give a reason for the choice?

C. SCOPE

This thesis will investigate the measurement of information system effectiveness over the past 20 years. It examines what methods have been employed in the MIS literature. In particular, attention is focused on the use of user satisfaction as a surrogate for effectiveness by the MIS community. Specific areas of interest include:

1. What method of measuring system effectiveness was employed?
2. How user satisfaction was initially determined/defined.
3. The evolution of the user satisfaction-effectiveness relationship and its current state.
4. How and why user satisfaction is employed as a surrogate for effectiveness.
5. Whether the employment of user satisfaction was justified, i.e., correct.

The data gathered will provide information as to the various methods of measuring IS effectiveness as well as

information regarding the recent prevalence of user satisfaction as the preferred method.

D. METHODOLOGY

A literature review will be undertaken to document the development of the user satisfaction-effectiveness relationship and the use of user satisfaction as a surrogate for IS effectiveness. It attempts to trace the origin of the relationship through to its current state. Attention will be focused on these questions:

1. How was effectiveness measured?
2. Were other methods considered and if so were there references cited?
3. If user satisfaction was chosen:
 - a. Was the purpose to show user satisfaction as equivalent to effectiveness? or,
 - b. Did the study assume equivalence and if so did it provide a reference?

Defining and classifying what user satisfaction is and is not and what it can and cannot be used for was accomplished by drawing analogies from the sociological research by Denzin (1989) and Phillips (1971) focusing in particular on the descriptions and limitations of the survey technique. This parallel was felt justified based on the common psychological nature of the measure and the technique used for its employment, the survey, between sociological research and the

user satisfaction measure of IS research. Basically, it was determined that user satisfaction as an opinion, i.e., subjective measure should not be employed as an equivalent to effectiveness, an action.

E. BENEFITS

User satisfaction has aggressively been developed as the primary method of measuring IS effectiveness. MIS needs to know if this is a proper measurement of its work. What we know about information systems we know through the methods by which we observe them and the concepts by which we mentally model them. If the concepts are erroneous we are vulnerable to investing in systems that, in reality, are ineffective.

II. BACKGROUND

A. WHY MEASURE IS EFFECTIVENESS?

"Information technology is now the largest line item in Corporate America's capital spending budget, accounting for nearly a third of current-dollar equipment outlays." (*Business Week*, 26 November 1990) The need to understand and measure information system effectiveness results from the fact that "U.S. business has spent hundreds of billions of dollars on them [computers], but white-collar productivity is no higher than it was in the late sixties." (*Fortune*, 26 May 1986)

Organizations have invested in information technology to increase productivity, specifically white-collar productivity. "Economists calculate that about 85% of investment in information technology is made by the service [white-collar] sector. Yet non-manufacturing productivity has risen cumulatively just 1.9% over the past 10 years. ... 'Unfortunately,' observes Morgan Stanley economist Stephen Roach, 'the service sector has devoted far more effort to deploying computers than in determining the precise ways they can be used to enhance white-collar productivity' ... Companies need to develop better ways of measuring office productivity and the contributions that managers and other

white-collar workers make to the bottom line." (*Business Week*, 26 November 1990)

Clearly then, increasing the effectiveness of information systems is a primary objective of business organizations. To do so, they need to know what factors affect and contribute to system effectiveness. It is this understanding of effectiveness which MIS research must provide so that increases in productivity and thus profits are realized, thereby justifying the current magnitude of investment in information systems by U.S. businesses.

1. The Goal of MIS Research

The goal of research is to increase the understanding of some relationship or situation. The goal of MIS research is to better describe and understand the factors and contributions of information systems to an organization. "MIS research is the systematic investigation of the development, operation, use and/or impact of an information (sub)system in an organizational environment." (Ives, Hamilton and Davis, 1980). The goal of information systems is to increase the effectiveness of the organization, where effectiveness is the ability of performance to meet the goals and objectives set by the organization. The purpose of evaluation is to assess or appraise the value of an activity and measure its effectiveness (Arnovick and Gee, 1978).

How MIS measures effectiveness is critical to the evaluation process and ultimately the overall understanding of information systems.

2. Measuring Effectiveness

Hamilton and Chervany (1981) present two different views of system effectiveness. Each has its own meaning of system effectiveness and how it should be measured. In the goal-centered view "Effectiveness is determined by comparing performance to objectives." An example of this approach would be cost-benefit analysis. The second is the system-resource view where effectiveness is seen as "attainment of a normative state, e.g., standards for 'good' practices" rather than establishing specific task objectives.

The complementary nature of these views is similar to that of summative and formative evaluation approaches. The focus of summative evaluation is the accomplishment of objectives. These are tangible factors capable of objective measurement. Formative evaluation is assessment of quality and consist of intangible factors measured subjectively. "Both formative and summative evaluation approaches are typically used in providing evaluative information on system effectiveness." (Hamilton and Chervany, 1981).

It is important to point out the significance of the dual nature of the evaluation process and the contributions and limitations of each approach.

a. Goal-Centered View

Basically the goal-centered view of system effectiveness focuses on the efficiency of the system. It assesses system performance with respect to established system and/or organizational objectives. Quantifiable (tangible) benefits provide objective measures of performance. Like the summative evaluation approach, the goal-centered view provides "information on the systems outcomes, or ends, to support decisions to continue, adopt or terminate the system." (Hamilton and Chervany, 1981). That is, the objectives set by the organization are the critical factors against which the system success or failure is judged.

b. System-Resource View

The system-resource view uses subjective measures of intangible benefits to assess the effectiveness of the system. Like the formative evaluation approach, the system-resource view provides supplementary/explanatory information about the system (Hamilton and Chervany, 1981).

B. THE REASON FOR THIS STUDY

Hamilton and Chervany's (1981) dual view of system effectiveness identifies these two system evaluation approaches as separate yet complimentary. This complimentary relationship is analogous to the one between summative and formative evaluation approaches where information provided by the formative evaluation helps "improve the means and process

to accomplish objectives and interpretation of summative evaluation results." They further explain (1981) that objective measures are provided by the "formal evaluation approaches" while "perceptions of system effectiveness" are gained by the informal ones which are "necessary and helpful for calibrating the credibility of information on MIS evaluation."

Assessing the accomplishment of official goals and objectives and thus the overall effectiveness, or success, of the system is the function of the formal evaluation approaches, i.e., goal-centered view, summative evaluation, and objective measures. The informal approaches; the system-resource view, formative evaluation, and subjective measures provide supplementary information, recognizing that "systems have other functions and have other consequences besides accomplishment of official objectives" (Hamilton and Chervany, 1981).

The message here is that the system-resource view, formative evaluation and/or subjective measures are informal approaches and are at best supplementary measures to "explain" or "help ... and aid." The point being that the goal-centered view, summative evaluation and objective measures are formal evaluation approaches and are the primary means of determining the success or failure of the system, to be supplemented by their "informal" counterparts.

Relevant to the current study is the subjective measure, user satisfaction, which is a perception of system effectiveness. Although Hamilton and Chervany suggest that "The user attitude survey [user satisfaction] is a formal approach to quantify subjective perceptions of system effectiveness." this thesis contends that user satisfaction is none the less just a supplementary measure of system effectiveness.

The hazard in employing user satisfaction as a prime means of evaluating the effectiveness of information systems, to the exclusion of assessing costs and benefits, is that it is an opinion-based technique. An example of the hazard is illustrated by international surveys of students' opinions of their math competency. In such surveys, U.S. high school students rate themselves among the worlds best. In actual testing of math skills, U.S. high school students are among the world's worst. The opinion is not the same as the skill. Similarly, users of information systems may have numerous motives to claim satisfaction with these systems. Yet, these opinion reports are not, conceptually, the same thing as an assessment of a system's productivity in terms of inputs and outputs or its quality in terms of better management decisions. Indeed, in two studies where both effectiveness and satisfaction were measured, the findings were contradictory, Gallupe and DeSanctis (1988), and Aldag and Power (1986). It is the distinction between primary and supplementary measures

that will serve as criteria for classifying articles reviewed in this thesis. The purpose will be to trace the genesis and evolution by which user satisfaction crowded out cost-benefit analysis.

III. METHODOLOGY

A. SELECTION OF SYSTEM EFFECTIVENESS STUDIES

1. Selection of Articles for Study

The concept of this study has as its impetus, questions raised in a previous thesis on information system effectiveness by Mustofa (1989). Therefore, it seemed reasonable to begin article selection with those identified as dealing with systems effectiveness in the preceding study. To these were added articles published after 1988, the last year included in the Mustofa study. These new articles were collected by the same means, which will be briefly discussed. (The reader may refer to Chapter III Methodology, Mustofa (1989) for a detailed account of the search and selection process.)

A consensus of journal names from three studies reporting on articles published in the MIS field was selected. The starting point was 1970 and continued through 1988. A DIALOG search from the INSPEC database was conducted by the Dudley Knox Library at the Naval Postgraduate School. The bibliographic search was on the following key: (Productivity or Effectiveness) and (Measures or Measurement or Assess or Assessment) and Information System. This automated search turned up a limited number of useful articles, fewer than 25.

Therefore, a manual search was conducted examining the periodicals on the consensus list between the years 1970 and 1988. Indices or every issue of periodicals without an index, were examined for articles possibly dealing with information system effectiveness. This search turned up 118 articles as well as the reason for the small number found during the on-line search, the limited number of key word synonyms for effectiveness and productivity. Additionally, articles were obtained from friends and colleagues aware of the situation or involved in related work as well as those published subsequent to 1988 up to July 1990.

2. Methods of Evaluating System Effectiveness

a. Knowledge

Knowledge accumulation is an important aspect in "the relationship between actions and outcomes" (Goldstein et al., 1990). Various methods of knowledge accumulation have been proposed and summarized by Goldstein et al. (1990): Weick (1979) believes that "individuals make sense of events retrospectively," that is, they assimilate information about the event(s) and then explain them retrospectively to understand them. Salancik and Porac (1986) have identified a three step process; gather data to understand cause and effect relationships, build a knowledge base of these relationships, and use them to come to generalized statements. Isenberg (1986) identified "a cycle of reasoning and action" using

existing knowledge identify any new information required and then act and update through feedback. Lord and Foti (1986) describe a knowledge representation scheme classifying different environmental elements which are used as prototypes and organized hierarchically for decision making.

The amount of knowledge accumulated is linked to job performance. Experts were found to have not only more information available to them but it was also more useable i.e., they had more and better descriptors, and more inter-category information (Lurigio and Carroll, 1985). Goldstein et al. (1990) used a knowledge classification scheme of declarative, procedural and causal knowledge. "Declarative knowledge consists of facts and definitional descriptions of categories ... Procedural knowledge is the heuristics and rules that guide a person's actions ... Causal knowledge consists of the description of the existence, strength and the direction of the relationships among categories and strategies."

b. Cost-Benefit-Analysis

"A cost-benefit-analysis (CBA) is essentially a comparison between two states. Proposed new system costs and benefits are usually compared with those of current systems whether they be manual, partly computerized or fully computerized." (Lincoln, 1986). There is usually little difficulty identifying costs of the systems as these are

usually well documented. However, identification of benefits and subsequently assigning a value to them has proven to be difficult. Basically there are two types of benefits, tangible and intangible. Tangible benefits are relatively easy to quantify and assign a value. Intangibles, on the other hand, have proven to be hard to quantify and when values were assigned they have been viewed skeptically. Often they are not even considered in the problem. There are different philosophies to the valuation of intangible benefits. Matlin (1979) argues for "placing dollar amounts on all intangible benefits" stating that "Difficulty in finding a value is not an appropriate reason for avoiding the subject. It is vitally important to derive techniques for valuing benefits of information system investments. Even an approximation of the values will provide managers an opportunity to make informed decisions about future investments. Without these values decisions may be made without appropriate information." (Matlin, 1979)

Another approach is made by Hall and Lincoln (1976). They consider only quantifiable benefits, estimate them conservatively and check "the financial results for accuracy and plausibility" reasoning that senior management has been made skeptical of CBA by "many examples of quick, glib, cost justification exercises."

The value obtained is then used in a comparison between pre and post system introduction, but requires a

stable environment or a control group in place to be a valid measure. Alternatively, the value may be compared against another system, which however, requires "a reconstruction of the state of affairs assuming either an alternative system is in place or the activity was not undertaken." (Lincoln, 1976). Determining the basis for comparison i.e., previous system, alternative technology or manual system and the level of service is complicated, difficult and uncertain. Senior executives often require initial comparison to a manual system. Its advantages include zero-based comparison and familiarity due to a large database of similar applications over many years.

CBA has been criticized because of the difficulty and subjectivity in identifying and/or evaluating the intangible benefits of unstructured, ad hoc decisions and obtaining determinable data supporting system success but unrecorded by an organization (Ives et al., 1983).

c. Value Analysis

Value analysis is similar to user satisfaction upon which it is based but is preferred in evaluating DSS (Money et al., 1988). Value analysis is employed in evaluating DSS and begins with the premise that "information is data of value in decision making" (Yovits and Foulk, 1985). They also suggest "that information gives rise to observable effects through the decision making process and information feedback exists so

that the decision maker (DM) will adjust his assessment of the decision situation for later decisions" (Yovits and Foulk, 1985). Money et al. (1988) using the method of conjoint measurement convert subjective judgement of the value of intangible benefits into scores for analysis.

d. Profit Maximization

A key objective of an organization is profit maximization. Information systems design should focus on achieving that goal. Marsden and Pingrey (1988) argue that decisions regarding IS be made as any other investment decision, "its contribution to the success of the firm." They develop a goal drive mathematical process model which seeks the goal of profit maximization. Using values of revenue enhancement or cost reduction of various information products and costs of the necessary man-machine inputs of those products, they maximize the difference. Citing numerous references in the economics and IS fields to support their technique, Cron and Sobol (1983) use multiple documented financial performance measures; pretax return on assets, return on net worth, pretax profits as a percent of sales and average five-year growth as indicators of performance, i.e., effectiveness.

e. Use

Use of a computer system is expected to improve performance of its users (Lucas, 1974). Therefore the

relationship between use of a system and performance (effectiveness) is investigated. Effective systems are assumed to attain higher use than less effective ones. However, this requires that use of the system is optional as for a DSS. With mandatory use of the system the relationship between use and effectiveness fails. Criticism of use as a measurement for effectiveness comes from the fact that it measures only the input to the system, whereas the desired value (performance/effectiveness) concerns the output of the system.

f. Productivity

Productivity as a measure of system effectiveness is a before and after comparison of some performance objective(s). There are various levels of sophistication in defining these objectives, from measuring simple letter production using a word processing system (Kapsales, 1986) to sophisticated regression models of multiple variables (Englander and Englander, 1985).

g. User Satisfaction

User satisfaction is a measure of the users subjective evaluation of factors concerning an information system's utility. These factors originate from work on organizational behavior by Cyert and March. They argue that the users "need for information" is either reinforced or frustrated by the information system, the success (effectiveness) of which is the users sense of satisfaction.

Most user satisfaction instruments use the semantic differential technique developed by Osgood, Suci and Tannenbaum, e.g., the Shultz-Slevin questionnaire. However, "Most of those that existed prior to an empirically derived methodology developed by Pearson (1977) have been heavily criticized" (Evans et al., 1988). Bailey and Pearson (1983) developed a tool from Pearson's 1977 dissertation, combining factors from "a review of 22 studies of the computer/user interface." The Bailey and Pearson tool is based on Wanous and Lawlers model defining satisfaction as "the sum of the user's weighted reactions to a set of factors,

$$S_j = \sum_{i=1}^n R_{ij} W_{ij}$$

where

R_{ij} = The reaction to factor j by individual i .

W_{ij} = The importance of factor j to individual i .

This model suggests that user satisfaction is the sum of ones positive and negative reactions to a set of factors." (Bailey and Pearson, 1983). Bailey and Pearson also utilize the semantic differential technique of Osgood et al.

Ives et al. (1983) reduced the Pearson tool to "a 'short form' of the instrument for use when time is limited and/or only an overall assessment of UIS [user information satisfaction] (rather than analysis of particular symptoms of a problem) is adequate."

h. Multiple Criteria

The general intent of multiple criteria studies is to more thoroughly "examine the significance of various information system characteristics" (Dickson et al., 1977) for "an easy-to-use instrument for improving the effectiveness of information systems" (Evans et al., 1988). Proponents of the multiple criteria approach conclude that "Information systems are a product of multiple factors" (Mansour and Watson, 1980). In general, some combination of system performance, goal attainment and user criteria is employed. The intent being to more fully describe and define the IS environment, thereby more accurately evaluating the IS effectiveness (Mansour and Watson, 1980; Chandler, 1982; Evans et al., 1988). Chandler suggests information systems be evaluated from two perspectives, one being the computer system domain the other the user domain, each having its own goals and measures. Evans et al. conclude that by applying different methodologies the various results "can work separately and in harmony with each other" (Evans et al., 1988).

3. Evolution of the User Satisfaction Tool

Cyert and March (1963) are credited by Bailey and Pearson (1983), and Ives, Olson and Baroudi (1983) with being the source of the user information satisfaction (UIS) concept. Basically, they argue that "when an organization discovers a solution to a problem by searching in a particular way, it

will be more likely to search in that way in future problems of the same type; when it fails to find a solution by searching in a particular way, it will be less likely to search in that way in future problems of the same type." Drawing inference from this to information systems, it is held that the ability of the system to meet the needs of the user either reinforces or frustrates the users' sense of satisfaction with the system. Therefore, it is suggested that "Satisfaction of users with their information systems is a potentially measurable, and generally acceptable, surrogate for utility in decision making" (Ives, Olson and Baroudi, 1983).

User satisfaction is a subjective measure of system success. It relies on the users perceived value of the information system's effectiveness to be a surrogate measure for objective measures deemed to difficult to obtain.

a. Early User Satisfaction Measures

The early measures of user satisfaction, those through 1977, had varied terminology for the concept of user satisfaction, for example: "appreciation" (Swanson, 1974), "user attitudes" (Lucas, 1974), "user perceptions" (Gallagher, 1974; Schewe, 1976), "perceived success" (Edstrom, 1977), "user evaluation" (Dickson, Senn and Chervany, 1977). Generally these measures were uniquely "designed" for the particular study that employed it. Often the definition and

construct of the variable were not described in the article, see Appendix E, Table VII.

b. The Shultz-Slevin Questionnaire

The Shultz-Slevin Questionnaire is based on the Likert and semantic differential techniques. The Likert instrument "consists of a number of statements to which the respondent indicates how strongly he agrees or disagrees on a five-point or seven-point scale" (Shultz and Slevin, 1975). The semantic differential is a scale that "consists of the statement of a concept to which an individual responds by checking a set of bipolar adjectives; good-bad." The Shultz-Slevin Questionnaire became the prevalent method in the studies reviewed from 1978 to 1983. The term user satisfaction became more common, although each study generally still had its own definition of "user satisfaction." However, the construct of the measure began to standardize around the Shultz-Slevin Questionnaire, see Appendix E, Table VII.

c. The Pearson Methodology and the Bailey and Pearson Instrument

Examining Table VII with respect to studies published after 1983 shows that either the Pearson Methodology or the Bailey and Pearson Instrument was almost the exclusive measure of user satisfaction when evaluating information system effectiveness. The Bailey and Pearson Instrument is

described in section (2), Methods of Evaluating System Effectiveness.

Evans et al. (1988) sum up the evolution of user satisfaction this way:

Instruments to measure user satisfaction are scarce. Most of those that existed prior to an empirically derived methodology developed by Pearson (Pearson, 1977) have been heavily criticized (Ives, Olson and Baroudi, 1982). Pearson's Methodology, which has received wide acceptance, uses a semantic differential technique to rate 39 factors which cause satisfaction or dissatisfaction with information systems. The 39 factors were identified based on extensive literature review and expert opinion. (Evans et al., 1988).

4. Selecting Articles Dealing With User Satisfaction

The compilation of articles for this study obtained from the search found 96 as possibly dealing with user satisfaction or system effectiveness. These then were the studies initially reviewed by this study and are listed in Appendix A.

a. User Satisfaction Studies

Reading the 96 articles in Appendix A yielded 40 articles dealing with user satisfaction or one of its aliases (as described in the preceding section). The selected studies employed user satisfaction or promoted its' employment as a measurement tool for some aspect of information system effectiveness. These included empirical studies on system effectiveness and methodological prescriptions for the employment of user satisfaction in measuring system effectiveness. These studies are listed in Appendix B.

b. *Alternative Measures of Effectiveness*

Appendix C lists the 19 studies included in this section. These alternative measures of effectiveness are described in the preceding section.

c. *Miscellaneous Literature*

Appendix F contains the 29 remaining studies reviewed. Included here are: literature reviews, essays, prescriptive methodologies, frameworks and tools; and 10 articles not specifically dealing with effectiveness measurement or were too unclear as to method or objective to evaluate properly.

B. REVIEWING THE USER SATISFACTION STUDIES

The 40 user satisfaction studies in Appendix B were evaluated with respect to the following criteria:

1. The conventional wisdom assertion (CWA).
2. Was the Justification Supported?
3. References rejecting alternative measures of effectiveness.

1. The Conventional Wisdom Assertion (CWA)

The idea of documenting the CWA occurred after the initial review of all articles. The impetus came from the following observations. One, that there were articles which directly claimed that user satisfaction was the generally accepted or prevalent method for measuring IS effectiveness.

Two, that often the only evaluation measure mentioned or considered was user satisfaction, i.e., possible alternative measures of IS effectiveness did not receive mention let alone consideration.

Determining which studies made the CWA category was then necessary. There were varying degrees of subtly encountered when trying to apply the CWA classification, from merely implied to outright claims of prevalence or general acceptance. The outright claims were relatively easy to identify, as most made the outright claim in the Abstract or Introduction. Some examples are:

The measurement of how satisfied a user is with his or her information system (user information system or UIS) has become a pervasive measure of the success or effectiveness of an information system. (Baroudi and Orlikowski, 1988).

To measure system success, researchers have mainly relied on either of two proxies: user satisfaction or system use. (Barki and Huff, 1985)

User information satisfaction is the preferred indicator of system success ... (Tait and Vessey, 1988)

One of the most widely used methods of evaluating system effectiveness is the user satisfaction survey." "... our rather wholesale acceptance of these [user satisfaction] evaluation tools. (Hufnagel, 1990)

The primary consideration in evaluating Management Information Systems (MIS) effectiveness is that it 'must be evaluated on the criteria of importance to the users'. (Lucas, 1978)

user satisfaction with MIS ... provides the most useful assessment of system effectiveness. (Hamilton and Chervany, 1981)

Table I of Appendix E contains those studies that were identified as having made the CWA. Appendix D, Annotated

Description of User Satisfaction Articles, contains the selected documentation evidence used for assigning the CWA classification to a study. Included in the description are quotations and page references. For outright claims that user satisfaction is the prevalent or accepted method of measuring system effectiveness, this documentation serves as complete evidence for the CWA classification decision.

Those that only implied the CWA were considerably more difficult to notice and especially difficult to document. This may seem contradictory to the notion of conventional wisdom. However, when taken to the extreme, conventional wisdom is an assumption by its user and, as such, is easily overlooked and difficult to pinpoint by an outside party searching for specific documentation. Additionally, the purpose of some studies was to further develop or test a particular user satisfaction tool. Generally, for these cases it was often necessary to examine the Introduction, Methodology (for description of the measurement tool), and Conclusions sections to determine the extent of an author's assumption regarding his intended and actual employment of the tool as a measure of effectiveness, with respect to the CWA.

The annotated description of User Satisfaction Articles, Appendix D, contains relevant quotations concerning the CWA. It should be noted that the quotations from some studies do not clearly indicate a conventional wisdom statement. However, they do at least suggest an attitude of

acceptance of the measure, which, when combined with other statements in the article, provided enough circumstantial evidence for it to be included in the CWA category. The circumstantial evidence which lead to the CWA judgement was mainly obtained from reading the Introduction, Methodology and Conclusions sections with respect to intent, actual employment and information provided about the system by the user satisfaction tool. The following are some examples:

In information systems (IS) research, user satisfaction (or user information satisfaction) is considered to be a key construct for assessing system performance. (Barki, 1990).

While acknowledging the importance of economic analysis of MIS value, researchers respond to the shifting emphasis from efficiency to effectiveness by focusing either on MIS usage or user perceived effectiveness. (Srinivasan, 1985)

2. Justification Supported

Justification Supported was the classification given to studies which properly applied user satisfaction as an effectiveness measure. When determining whether the employment of user satisfaction was justified the criterion of this study was the degree to which the tool was to measure effectiveness. Was it as a "relative" measure or as an "absolute" measure of system effectiveness? In other words, a "better" or "more" effective system rather than that the system "was" or "was not" successful. The choice of relative or absolute measure was selected as best describing the myriad of approaches to employment user satisfaction has in the literature, from a

single item (factor) measure of early works, to multi-factor measures employed in a triangulation method.

This study used as its basis for judgement, arguments from Denzin (1989) and Phillips (1971). These were chosen for their information concerning the survey technique, its use and limitations.

Denzin presents the theory of symbolic interactionism as the perspective from which to analyze research methods. Briefly summarized the concept of symbolic interactionism is:

If human behavior is observable at two levels - the symbolic and the interactional - then central to understanding such behavior is the range and variety of symbols and symbolic meaning shared; communicated and manipulated by interacting selves in social situations. Society contributes two essential elements that reflect directly on concrete interactions: (1) the symbols; or various languages provided and communicated through the socialization process, and (2) the concrete behavioral settings in which the interaction occurs. (Denzin, 1989)

With respect to this study, the symbolic level is interpreted as the opinion expressed by the user regarding his or her satisfaction with the system and the interactional level is that of the observed or measured behavior, effectiveness or performance, of the user himself. Regarding the survey technique, Denzin states that " Users of the survey seldom combine symbols with interaction ..." (Denzin, 1989).

Phillips, when discussing interviews and questionnaires states that:

... inferences about nonverbal behavior which are based on nonverbal responses are more subject to distortion and errors than are inferences about future or past nonverbal behavior which are based on the observation of such

behavior. That is, it is easier to 'lie with words' than to 'lie with acts' (Phillips, 1971).

Here again the author questions the ability of the survey technique to draw inference to nonverbal behavior, i.e., action. Furthermore, only some of the user satisfaction authors, Table VIII, have addressed questions of measurement validity and reliability. However, one particular type proposed by Phillips that seems pertinent has not, convergent-discriminant validity. This is the ability to invalidate measures by showing that they "correlate poorly with some criterion but also by showing not only that they correlate highly with some conceptually simpler variable, such as the tendency to respond true or in a socially desirable manner at all times." (Phillips, 1971).

The basic premise in the current study is drawn from arguments by Denzin and Phillips, that is, that users responses on a user satisfaction survey regarding information system effectiveness (opinion) are not the same as measuring performance as a result of an information system. This study makes a differentiation between the relative measure, employment as a descriptor or supplementary measure of the system and the absolute measure, success or failure of the system as its means of classifying opinion (relative) and action (absolute). The delineation was made by drawing an analogy to the opinion-performance arguments of Denzin and Phillips. Relative measures were viewed as analogous to

opinion, i.e. they can enhance or supplement objective or primary measures but cannot stand on their own. Absolute measures, on the other hand, have the necessary and sufficient conditions to stand on their own. The relative measures were designated Justification Supported while the absolute were not.

Deciding if a particular study's employment of user satisfaction was justified, this study first looked at whether the article being reviewed employed a multiple-criteria method, i.e., user satisfaction was supplementing information from another measurement technique. This ancillary use was determined to be a justified use of the user satisfaction tool and classified as a relative measurement thus was a case of Justification Supported. There was considerable latitude in applying the multi-criteria test. This broad interpretation was because this author was not skilled in determining the validity of the various research methods encountered and wished to be as conservative as possible in assigning restrictions to the method, thereby providing the researchers the widest possible latitude in their employment of the user satisfaction tool.

Studies which used user satisfaction as the sole means of measuring the system effectiveness constituted the other major category. It was necessary to determine the use of the user satisfaction tool's value, was it for relative qualification or judgement of the system or was it for an

absolute quantification or description of the system's success or failure. This was a particularly difficult assessment to make. As with the CWA, some authors stated directly how they intended to employ the tool, while others had conflicting statements in their articles which required analyzing the intent and conclusions drawn from the measure's employment. The following are examples of the basic Justification Supported categories:

Justification Supported: Yes, relative measure.

concerned only with identifying difference in the affective response patterns of the two groups of performers (as opposed to arriving at a 'true' measure of value. (Hufnagel, 1990)

Justification Supported: No, absolute measure.

The measurement of how satisfied a user is with his or her information system (user information satisfaction or UIS) has become a pervasive measure of the success or effectiveness of an information system. (Baroudi and Orlikowski, 1988)

Justification Supported: Yes, multiple criteria.

The purpose of this study was to apply four methodologies to help understand and measure current information systems ... The objective is to recommend an easy to use instrument for improving the effectiveness of information systems. (Evans et al., 1988)

Table I of Appendix D contains the determination data on Justification Supported. Additionally it contains the page number where relevant information leading to the judgement is located. Appendix D contains selected quotations which either provide direct evidence or substantial circumstantial evidence

documenting the study's documentation Justification Supported decision.

Another category of data in this thesis was whether there was a specific reference to rejection of an alternative measure(s) of system effectiveness, see Table V, Appendix E. All that was required was for a study to include somewhere in its discussion and in its list of references an alternative measure. The point being, that there was an attempt made at selecting an appropriate method to measure system effectiveness.

IV. FINDINGS

Appendix D contains an annotated description of each of the 40 user satisfaction studies evaluated here. Appendix E contains the detailed tables of findings for each aspect of this study. They are listed in chronological order by date of publication.

Studies in Appendix B employed a form of user satisfaction measure to evaluate the effectiveness of an information system.

In Appendix C, the studies used an alternative measurement tool to evaluate system effectiveness.

A. CONVENTIONAL WISDOM ASSERTION

The first question for which an answer was sought was what number of articles assume user satisfaction is currently the conventional wisdom or prevalent method employed by the IS community when measuring the effectiveness of an information system.

Table I of Appendix E condenses out of Appendix B the primary references cited by each author for choosing user satisfaction as a surrogate measure of system effectiveness and for those with none listed the conventional wisdom assertion (CWA) was assigned. Table II shows that the CWA is the only reference for 45% of the MIS studies that employ user

satisfaction as a measurement tool. This implies that MIS researchers presuppose not only that user satisfaction is the preferred method of measuring MIS effectiveness but that it has also been proven and accepted as such by the MIS community. This is certainly not the case as shown by Appendix C, which lists 19 studies that use alternative methods of measuring an information system's effectiveness. Additionally, it contains several references in MIS literature rejecting user satisfaction as an absolute or single value measurement of a system's effectiveness (Ahituv, 1980; Marsden and Pingrey, 1988; Hufnagel, 1990) on theoretical or methodological grounds.

Additional distillation of the data in Table I at years 1977 (Pearson) and 1983 (Bailey and Pearson) provides further insight into the genesis and evolution of the CWA. In 1977 Pearson's dissertation developed a tool for measuring user satisfaction. In 1983 Bailey and Pearson further refined the tool in a published article (Bailey and Pearson, 1983). Evans et al. (1988) state that "Instruments to measure user satisfaction are scarce." Most of those that existed prior to an empirically derived methodology developed by Pearson have been heavily criticized. Now, examining the percentage of the CWA in studies from 1977 forward and 1983 forward it appears that the emergence of the CWA has its origins with Pearson's 1977 dissertation and its widespread practice with the publishing of the 1983 Bailey and Pearson study. There is also

an increase in the number of empirical studies evaluating IS (Alavi et al., 1989).

Studies with a CWA of user satisfaction have grasped this tool as the an easy and reliable way to measure system effectiveness. Often they have ignored the limitations stated by Bailey and Pearson concerning its use. Bailey and Pearson propose that it be used for "relative" evaluation, i.e. comparison of and between systems. Many authors making the CWA imply and draw conclusions of user satisfaction's absolute measurement of system effectiveness.

B. JUSTIFICATION SUPPORTED

Table III contains the studies of Appendix B which have a justification for employment of user satisfaction that is supported by the reference literature, i.e., that the user satisfaction tool was used properly according to a cited, developed methodology and subsequent conclusions limited to the theoretical restrictions of the tool. The judgement supported perspective shows that over 40% of the studies employing user satisfaction have incorrectly applied the tool. The most common error was to wrongly imply an absolute value of system effectiveness from the level of user satisfaction, i.e., a successful or unsuccessful system, rather than a relative measure, which is a comparison between alternatives or situations.

Only 19 of the 40 user satisfaction studies properly applied the user satisfaction tool. Those that did limited its range of measure to some aspect of relative effectiveness rather than employing it as an absolute measure.

Eight of the 19 are multiple criteria evaluations where user satisfaction was employed as one of several effectiveness measures. The multiple criteria approaches in general centered around "the relationship between satisfaction and bottom line indicators of user and organization performance" (Bailey and Pearson, 1983). These bottom line indicators are what this study considers absolute measures of effectiveness (performance).

When user satisfaction was employed as a single item measure it was most commonly used as a "tool for improving system design" (Bailey and Pearson, 1983), which is supplementary or descriptive and thus classified as a relative measure by this study.

Further examination of the studies that use the CWA shows that 66% of them have also incorrectly applied the tool. The implication here is that not only have researchers not evaluated other methods of measurement as evidenced by the CWA, but that they have also not evaluated the user satisfaction tool itself and understood its limitations and restrictions in particular those citing Bailey and Pearson.

C. REFERENCES TO REJECTION OF ALTERNATIVE MEASURES

Table V applies a breakdown similar to both CWA and Justification Supported with respect to studies which actually reference an article which supports the rejection of alternative measures to user satisfaction. Common statements such as "it is too difficult" or "too costly" without reference, forms another category of conventional wisdom, i.e., that alternative methods cannot be used for measuring system effectiveness. MIS authors using user satisfaction have polarized their view of MIS effectiveness measurement to the point that it consists solely of the user satisfaction tool.

D. REJECTION OF USER SATISFACTION

Various articles in MIS literature have rejected, whole or in part, user satisfaction as a surrogate measure of system effectiveness. Hall and Lincoln (1976) "considered the possibility of measuring user satisfaction as a surrogate measure for information utility ... However it was felt that an index of user satisfaction would not have provided senior BAC-CAD management with the means to compare the effectiveness of information systems with that of other company resources." This early rejection of the measure conceptualizes the ultimate purpose of any absolute evaluation measure, which is an overall assessment. The value of which is either for judging the success or failure of the system or as a common measure to compare one system to another. In either case the

value of the measure is complete in itself, i.e., it can stand alone and convey valuable information, for justifying company resources or comparing completely separate information systems.

The other use to which an evaluation measure is put is to compare the relative value within a single item context, i.e., better/worse rather than successful/failure. Here again, critics have found fault with user satisfaction on both theoretical and methodological grounds. Many reject it saying "single item" measures are inadequate (Larker and Lessig, 1980; Hamilton and Chervany, 1981; Barki and Huff, 1985). Additionally, others (Matlin, 1979; Markus and Robey, 1983; and Jarvenpaa et al., 1985) argue that user satisfaction measures often lack theory and that the results are subject to influence by other factors within the system and therefore it is an inconsistent measure and a meaningless tool for evaluation.

V. CONCLUSIONS

The evolution of user satisfaction as a surrogate measure for IS effectiveness suffers from two deficiencies. The first is, that in 45 percent of the studies reviewed, it was the only method considered, which this study has labeled the conventional wisdom assertion (CWA). The second stems in part from the CWA, that in over 65 percent of the studies the tool was improperly applied.

The MIS community's desire for credibility as a research field has led in part to the CWA. A credible user satisfaction measurement tool was lacking before that introduced by Pearson (1977) and developed by Bailey and Pearson (1983). This prior void and the lack of empirical studies in MIS research (Alavi et al., 1989) contributed in large part to a blind acceptance of the user satisfaction tool as a surrogate measure for system effectiveness by those making the conventional wisdom assertion. Many in the MIS community grasped the Bailey and Pearson tool without regard to its foundation, often improperly applying it. By failing to question the newly developed tool and even failing to understand its limitations, those making the CWA have done a disservice to the MIS community and MIS as a whole. Citing Keen (1980) Alavi et al. (1989) in their review of MIS research say "Even emerging fields such as MIS have a sense of history; those who cut

themselves off from curiosity and reflection are likely to atrophy."

Additionally, the MIS community's need for empirical research (Alavi et al., 1989) facilitated the acceptance of user satisfaction as an empirical tool. There were no instances of the CWA in MIS studies prior to Pearson's 1977 dissertation and by Bailey and Pearson's 1983 study 57 percent of those that employed user satisfaction made the CWA. This highlights the blind acceptance of it by many researchers in the MIS community.

The second problem is that of improper application. Basically the user satisfaction tool, as developed by Pearson and modified by others (Bailey and Pearson, 1983; Ives et al., 1983) is intended to measure satisfaction as an indicator of the relative effectiveness of an information system by means of "his/her reaction to the [user satisfaction] factor relative to the perceived information requirements" (Bailey and Pearson, 1983). If the user satisfaction value is higher for one case than another the higher valued system will be more effective than a lower valued one, whether it is the same system which was or will be modified or a totally separate one. It is not able to evaluate the absolute effectiveness of an information system. That would require a comparison between inputs and outputs of the system(s). As Marsden and Pingrey (1988) point out "the key end user, the firm, will be

'satisfied' when its investment decision, that of the information system, contributes to the success of the firm."

Therefore, if properly applied employing user satisfaction as a surrogate measure for system effectiveness may indicate "more" or "less" effective systems. However, 40 percent of all user satisfaction studies reviewed and 57 percent of those which were conducted in 1983 and later (Bailey and Pearson) improperly applied the tool. This improper application is due to its employment as an absolute measure of system effectiveness. Combined with the conventional wisdom assertion, the implication is that MIS research using user satisfaction is on uncertain ground. Not only is the conventional wisdom assertion made by many authors (table I) not justified but when employed user satisfaction is improperly applied nearly half the time. The researchers have not only accepted the surrogate unquestioningly but they have also not bothered to understand and correctly apply it. This has a negative effect on the MIS community which is seeking credibility as a scientific research field (Alavi et al., 1989) and for the justification of the financial investments being made in information systems (*Fortune*, 26 May 1990).

The intent of this study was not to determine the scientific validity of user satisfaction as a surrogate measure of effectiveness. It was however, intended to shed some light on its evolution and use in MIS literature. Examining studies measuring system effectiveness it was

determined not only that methods other than user satisfaction are "alive and well," thus dispelling the conventional wisdom assertion, but also that user satisfaction may be the "hobgoblin" of effectiveness measurement (Soergel, 1976).

VI. RECOMMENDATIONS

The role of MIS research is to increase our understanding of information systems, thereby allowing prediction of outcomes and consequences of the various factors influencing an information system. To do so researchers must develop theories with which to guide research and research methodologies (Alavi et al., 1989) which provide a systematic investigation of these factors. The focus of this study was on the measurement of effectiveness of information systems. In particular, the evolution and use of user satisfaction as a surrogate measure of effectiveness. At issue was the employment of user satisfaction, an opinion, as a measure of effectiveness, an action.

The articles read for this study and the subsequent findings suggest several things regarding the measurement of effectiveness of information systems. To begin with, the MIS community must define a standard framework of information system effectiveness. The wide variety of effectiveness definitions encountered made it difficult to assess the validity of any given measure. Additionally, a "systematic investigation" is difficult in that findings are not replicated and verified, and methodologies are not advanced by refinement.

Next, theories should be developed and tested. The fact that almost half of the user satisfaction studies applied the CWA and that 40% improperly applied the tool indicates that the field is not thinking about the theory behind the relationship. The difficulty that the academic field of management science has found linking satisfaction with performance should draw into question an analogous relationship in MIS between user satisfaction and effectiveness.

Additionally, social scientists have questioned the validity of the survey as a research method and in particular, as an accurate measure of behavior. Less than a quarter of the user satisfaction studies did any validity checks and only one questioned the validity of user satisfaction as a surrogate for effectiveness by testing for other possibilities. Instead the validity checks merely sought to find a correlation between user satisfaction and another attitudinal variable.

The ubiquitous statements in the literature that intangibles cannot be accurately measured, are too difficult, too time consuming or too costly to obtain, often without reference suggest a general attitude exists in the MIS community regarding effectiveness measurement. Combined with the fact that the MIS community seems to have embraced the use of a subjective surrogate for the same ends, it makes one wonder about the motivation or competence behind the research. Are we further extending our knowledge of information systems

or, is it an easy way to publish and gain tenure? Was the research strategy selected the best choice or the easiest?

The MIS community needs to provide valuable information concerning information systems to the user community so that they may invest their capital resources more effectively in information systems. As Marsden and Pingrey (1988) point out "the key end user, the firm, will be 'satisfied' when its investment decision, that of the information system, contributes to the success of the firm."

APPENDIX A. LIST OF ARTICLES REVIEWED BY THIS STUDY

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Lucas, H.C., Jr., "System Quality, User Reactions and The Use of Information Systems," *Management Informatics*, Vol. 3, No. 4, (1974), pp. 207-212.

Lucas, H.C., Jr., "Application and Implementation/Unsuccessful Implementation: The Case of a Computer-Based Order Entry System," *Decision Sciences*, Vol. 9, No. 1, (January 1978), pp. 68-79.

Maggiolini, P., "Office Automation Benefits: A Framework," *Information and Management*, Vol. 10, (1986), pp. 75-81.

Mahmood, M.A., "Development and Validation of a Tool for Measuring and Analyzing Decision Support Systems User Satisfaction," (preprint), pp. 171-173.

Mansour, A.H., and H.J. Watson, "The Determinants of Computer Based Information System Performance," *Academy of Management Journal*, Vol. 23, No. 3, (September 1980), pp. 521-533.

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Marsden, J.R., and D.E. Pingry, "End User-IS Design Professional Interaction-Information Exchange for Firm Profit or End User Satisfaction?" *Information and Management*, Vol. 14, (1988), pp. 75-80.

Martin, M.P. and J.E. Trumbley, "Measuring Performance of Automated Systems," *Journal of Systems Management*, (February 1986), pp. 7-17.

Mason, A., "Computers and Productivity," *Public Productivity Review*, (March 1984), pp. 70-84.

Mason, R.O., "Measuring Information Output: A Communication Systems Approach," *Information & Management*, Vol. 1, No. 5, (October 1978), pp. 219-234.

Mason, R.O., and I.I. Mitroff, "A Program for Research on Management Information Systems," *Management Science*, Vol. 19, No. 5, (January 1973), pp. 475-487.

Matlin, G., "What is the Value of Investment in Information Systems?" *Management Information Systems Quarterly*, Vol. 3, No. 3, (September 1979), pp. 5-34.

Miller, J., and B.A. Doyle, "Measuring the Effectiveness of Computer-Based Information System in the Financial Sector," *Management Information Systems Quarterly*, Vol. 11, No. 1, (March 1987), pp. 107-124.

Money, A., D. Tromp, and T. Wegner, "The Quantification of Decision Support Benefits Within the Context of Value Analysis," *Management Information Systems Quarterly*, (June 1988), pp. 223-236.

Neumann, S., and E. Segev, "A Case Study of User Evaluation of Information Characteristics for Systems Improvement," *Information & Management*, Vol. 2, (1979), pp. 271-278.

Powers, R.F., and G.W. Dickson, "MIS Project Management: Myths, Opinions and Reality," *California Management Review*, Vol. 15, No. 3, (1973), pp. 147-156.

Radecki, T., "New Approach to the Problem of Information System Effectiveness Evaluation," *Information Processing and Management*, Vol. 12, (1976), pp. 319-326.

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Robey, D., and R.L. Zeller, "Factors Affecting the Success and Failure of an Information System for Product Quality," *Interfaces*, Vol. 8, No. 3, (February 1978), pp. 70-75.

Rouse, W.B., "On Meaningful Menus for Measurement: Disentangling Evaluative Issues in System Design," *Information Processing and Management*, Vol. 23, No. 6, (1987), pp. 593-604.

Sainfort, et al., "Decision Support System Effectiveness: Conceptual Framework and Empirical Evaluation," *Organizational Behavior and Human Decision Processes*, Vol. 45, (1990), pp. 232-252.

Schewe, C.D., "The Management Information user: An Exploratory Behavioral Analysis," *Academy of Management Journal*, Vol. 19, No. 4, (December 1976), pp. 577-590.

Snitkin, S.R. and W.R. King, "Determinants of the Effectiveness of Personal Decision Support Systems," *Information & Management*, Vol. 10, No. 2, (January 1986), pp. 83-89.

Soergel, D., "Is User Satisfaction a Hobgoblin?" *Journal of the American Society for Information Science*, (July-August 1976), pp. 256-259.

Srinivasan, A., "Alternative Measures of System Effectiveness: Associations and Implications," *Management Information Systems Quarterly*, Vol. 9, No. 3, (September 1985), pp. 243-253.

Strassmann, P.A., "Managing the Costs of Information," *Harvard Business Review*, (September-October 1976), pp. 133-142.

Sullivan, R.S., and S.C. Secrest, "A Simple Optimization DSS for Production Planning at Dairyman's Cooperative Creamery Association," *Interfaces*, Vol. 15, No. 55, (September-October 1985), pp. 46-53.

Swanson, E.B., "Management Information Systems: Appreciation and Involvement," *Management Science*, Vol. 21, No. 2, (October 1974), pp. 178-188.

Tait, P., and I. Vessey, "The Effect of User Involvement on System Success: A Contingency Approach," *Management Information Systems Quarterly*, (March 1988), pp. 91-108.

Yovits, M.C., and C.R. Foulk, "Experiments and Analysis of Information Use and Value in a Decision Making Context," *Journal of American Society for Information Science*, Vol. 36, No. 2, (March 1985), pp. 63-81.

**APPENDIX B. LIST OF STUDIES EMPLOYING USER SATISFACTION AS
EFFECTIVENESS MEASURE**

STUDY	YEAR	CWA	JUSTIFICATION SUPPORTED	REFERENCE REJECTING ALTERNATIVES
1. Barki	90	Y *p. 408	N *p. 402	N
2. Burkhard	90	N (MC)	Y p. 421	NA (MC)
3. Conrath/Mignen	90	Y p. 7	Y p. 16	N
4. Hufnagel	90	Y p. 437	Y p. 441, 437	N
5. Baroudi/Orlikowski	90	Y p. 44	N p. 44-45	N
6. Doll/Torkadek	90	N	N p. 260	Y
7. Evans et al.	90	N (MC)	Y p. 228, 236	NA (MC)
8. Gallupe/DeSanctis	90	N (MC)	Y p. 284	NA (MC)
9. Gumaraes/Gupta	90	Y p. 18	N p. 18	N
10. Tait/Vessey	90	Y p. 95-96	N P. 95-96	N
11. Miller/Doyle	90	Y p. 108	N p. 107-108	N
12. Aldag/Power	90	N (MC)	Y p. 579, 584	NA (MC)
13. Baroudi/Olson/Ives	90	Y P. 233	Y p. 233	N
14. Franz/Robey	90	Y p. 335	Y	N
15. Franz/Robey/Koeblitz	90	Y p. 32	Y p. 32	N
16. Martin/Trumbley	90	N (MC)	Y p. 14	NA (MC)
17. Barki/Huff	90	Y p. 262	N p. 262	Y p. 262
18. Hogue/Watson	90	N p. 206	N p. 210-211	NA (?)
19. Srinivason	85	Y p. 243	Y p. 243	Y
20. Bailey/Pearson	83	Y p. 530	Y p. 530	N
21. Ives/Olson/Baroudi	83	Y P. 785	N p. 791, 792	Y p. 785
22. King/Epstein	83	N	Y p. 34, 43	NA (MC)
23. Mahmood	83	Y p. 171	N p. 171	N
24. Epstein/King	82	N	N p. 255	NA
25. Ginzbrerg	81	Y p. 467	N p. 463	N
26. Hamilton/Chervany	81	Y p. 79	N p. 84	NA (MC)
27. Larker/Lessig	80	Y p. 121	N p. 121	N
28. Deese	79	NA	Y p. 66	NA
29. Nueman/Segev	79	N p. 35	Y p. 35	N

STUDY	YEAR	CWA	JUSTIFICATION SUPPORTED	REFERENCE REJECTING ALTERNATIVES
30. Robey	79	N	Y p. 534, 537	N
31. King/Rodriguez	78	N	Y p. 45, 50	NA (MC)
32. Lucas	78	N	N p. 72	Y p. 69
33. Robey/Zellar	78	N	Y p. 71, 73	N
34. Dickson/Senn/Chervany	77	N (MC)	Y	NA (MC)
35. Edstrom	77	N	N p. 589	N
36. Schewe	76	N	Y p. 589	N
37. Gallagher	74	N	Y p. 52	Y
38. Lucas	74	N	Y p. 210-211	NA (MC)
39. Swanson	74	N	Y p. 180	N
40. Powers/Dickson	73	N	Y p. 150	NA (MC)

* denotes the page number in the study where statements supporting these classifications are located

**APPENDIX C. LIST OF STUDIES EMPLOYING ALTERNATIVE METHODS OF
EFFECTIVENESS MEASURE**

STUDY	YEAR	EFFECTIVENESS MEASUREMENT TOOL	REFERENCE REJECTING U SAT OR AH
1. Goldstein/Cho/Zack	90	Knowledge	N
2. Money/Tromp/Wegner	88	Value analysis	Y p. 223
3. Marsden/Pingrey	88	Profit max	Y p. 76
4. Kapsales	86	Cost avoidance (productivity)	N
5. Lincoln	86	CBA	Y p. 26
6. Sullivan/Secrest	85	Optimization (profit)	N
7. Englander/Englander	85	Cost savings	N
8. Snitkin/King	86	User attitude	N
9. Yovitz/Foulk	85	Value analysis	N
10. Cron/Sobol	83	Profitability	Y p. 172
11. Chandler	82	Multiple cirteria	NA
12. Edelman	81	CBA	Y p. 5
13. Altmeyer/Bozeman	81	User attitude	N
14. Mansour/Watson	80	Multiple criteria	NA
15. Ahitau	80	Utility	Y p. 61
16. Maltin	79	Value analysis	N
17. Radecccki	76		N
18. Hall/Lincoln	76	CBA	Y p. 266
19. Lucas	75	Useage	N

APPENDIX D. ANNOTATED DESCRIPTION OF USER SATISFACTION STUDIES

Barki, H. "Determinants of User Satisfaction Judgements in Information Systems," *Proceedings of the Twenty--third Annual Hawaii Conference on System Sciences*, Vol. VII, (1990), pp. 408-417.

Attribution, expectation, disconfirmation and performance is determinant of user satisfaction judgements.

"performance is much more dominate"

CWA: "In information systems (IS) research, user
p. 408 satisfaction (or user information satisfaction) is considered to be a key construct for assessing system performance."

JS: "User satisfaction is also used by IS professionals
in evaluating the performance of specific
p. 408 information system applications or the overall information system in an organization."

"an implied equivalence between user evaluations of system performance and their feelings of satisfaction...If such an equivalence exists, then measuring satisfaction as a surrogate for system performance or effectiveness can be meaningful."

RR Alt: None

Burkhard, D.L., "Examination of Factors Contributing to the Success of the Implementation of Computer-Aided Software Engineering Technology," *Proceedings of the Twenty-third Annual Hawaii Conference on System Sciences*, Vol. VI, (1990), pp. 418-427.

"A proposed model consisting of variables that potentially influence the development and maintenance processes is evaluated in respect to several performance measures."

CWA: No

JS: "Satisfaction with the system has been used as a
p. 421 surrogate for IS effectiveness (Mahmood 1985-1986) "

RR Alt: NA - M.C.

Conrath, D.W., and O.P. Mignen, "What is Being Done to Measure User Satisfaction with EDP/MIS," *Information and Management*, Vol. 19, (1990), pp. 7-19.

If and how organizations are measuring user satisfaction what do they perceive as benefits of doing so.

not many organization appear to do it (measure user satisfaction)
those that do value it substantially

CWA: "There is substantial literature that suggests it
p. 7 is important to measure user satisfaction with EDP/MIS products and services."

JS: (1) to try to improve the quality...
p. 16 (2) to increase the degree...
(3) to have better relations with users...
(4) to determine the level of sat. of users...

RR Alt: None

Hufnagel, E.M., "User Satisfaction - Are We Really Measuring System Effectiveness?" *Proceedings of the Twenty-Third Annual Hawaii Conference on System Sciences*, Vol. VI, (1990), pp. 437-446.

Examines whether "user perception regarding an IS provide an accurate measure of system quality"

"The pattern of causal reasoning observed here raise serious questions about the validity of employing user sat. ratings as measures of system effectiveness."

CWA: "One of the most widely used methods of
p. 437 evaluating system effectiveness is the user satisfaction survey."

JS: "Sure the hypothesis being tested (H3) is
p. 441 concerned only with identifying the differences in the affective response patterns of two groups of performance (as opposed to arriving at a "true" measure of value)."

RR Alt: None

Baroudi, J.J., and W.J. Orlikowski, "A Short Form Measure of User Information Satisfaction: A Psychometric Evaluation and Notes on Use," *Journal of Management Information Systems*, Vol. 4, No. 4, (Spring 1988), pp. 44-59.

Develops short form measure of user satisfaction from B/P

CWA: "The measurement of how satisfied a user is with
p. 44 his or her information system (user into satisfied or unsatisfied) has become a pervasive measure of the success or effectiveness of an information system."

JS: "has become a pervasive measure of the success or
p 44-45 effectiveness of an information system"

RR Alt: None

Doll, W.J. and G. Torkzadeh, "The Measurement of End User Computing Satisfaction," *Management Information Systems Quarterly*, (June 1988), pp. 259-274.

instrument for measuring end user satisfaction

- CWA:** No
- JS:** "End user computing satisfaction (EUCS) is a
p. 259 potentially measurable surrogate for utility in
decision making."
- RR Alt:** "decision analysis approach is generally not
p. 259 feasible (Gallagher, 1974, Nolan and Seward,
1974) "

Evans, et al., "An Instrument for Measuring Effectiveness of Information Systems," *Computers and Engineering*, Vol. 14, No. 3, (1988), pp. 227-236.

Multi Criteria approach to understand and measure
information systems
information flows
user needs
utility of information
user satisfaction
alone and in combination are useful for improving
information systems

- CWA:** No
- JS:** "After identifying dissatisfied individuals on
p. 234-235 the Pearson NSI matrix, studying results of the
printouts for individuals from the Krobock
Methodology can help to show where improvements
can be made in specific sources of information to
increase the satisfaction of these individuals."
- p. 228 "alone and in combination are useful for
improving information systems"
- RR Alt:** NA

Gallupe, R.B., and G. DeSanctis, "Computer-Based Support for Group Problem Finding: An Experimental Investigation," *Management Information System Quarterly*, Vol. 12, No. 2, (June 1988), pp. 277-296.

Examines Group DSS on group discussion quality and individual perceptions

"confidence and satisfaction ... lower in GDSS supported groups than in non-supported groups"

CWA: NA

JS: "dependent variables were the discussion
p. 284 performances and perceived reactions

RR Alt: NA

Gurmaraes, T., and Y.P. Gupta, "Measuring Top Management Satisfaction with the MIS Department," *Omega International Journal of Management Science*, Vol. 16, No. 1, (1988), pp. 17-24.

"questionnaire to measure top management's satisfaction with their MIS department"

CWA: "researchers have traditionally used measures of
p. 18 user information satisfaction instead"

JS: "How should one assess overall MIS department
p. 18 performance?"

RR Alt: "Many of the variables involved in assessing an
p. 18 MIS department's importance are
intangible...Because of the difficulty of
evaluating the economics of information systems."

Tait, P., and I. Vessey, "The Effect of User Involvement on System Success: A Contingency Approach," *Management Information Systems Quarterly*, (March 1988), pp. 91-108.

"Path analysis was used to investigate both the direct effects of the contingent variables on system success and the effect of user involvement."

CWA: "assessing the satisfaction of the user with the
pp. 95-96 information provided by the system is probably
the most common approach to measuring system
success ... user information satisfaction is the
preferred indicator of system success"

JS: "information satisfaction is the preferred
pp. 95-96 indicator of system success and is the measure
used in this study to define successful systems
development"

RR Alt: None

Miller, J., and B.A. Doyle, "Measuring the Effectiveness of Computer-Based Information System in the Financial Sector," *Management Information Systems Quarterly*, Vol. 11, No. 1, (March 1987), pp. 107-124.

instrument for measuring information system's
effectiveness

CWA: "The instrument used in this research consists of
p. 108 38 items, 24 of which derive from Pearson, 12
from Alloway."

JS: "the effectiveness of the overall information
p. 107 system's effort ... is evaluated using an
instrument based on previous work"

RR Alt: No

Aldag, R.J., and D.J. Power, "An Empirical Assessment of Computer Assisted Decision Analysis," *Decision Sciences*, Vol. 17, No. 14, (Fall 1986), pp. 572-588.

lab study with multiple criteria

CWA: NA

JS: "Individuals ... will exhibit more confidence in,
p. 576 and satisfaction with"

RR Alt: NA

Baroudi, J.J., M.H. Olson and B. Ives, "An Empirical Study of the Impact of User Involvement on System Usage and Information Satisfaction," *Communications of the ACM*, Vol. 29, No. 3, (March 1986), pp. 232-238.

"that user involvement leads to system usage and/or information satisfaction"

CWA: "user satisfaction. Generally these constructs
p. 233 are assumed to be indirect indicators of improved decision making performance"

JS: See CWA

RR Alt: None

Franz, C.R., and D. Robey, "Organizational Context, User Involvement, and the Usefulness of Information Systems," *Decision Sciences*, Vol. 17, No. 3, (Summer 1986), pp. 329-355.

user involvement is positively related to user's perceptions of system usefulness

CWA: cites Bailey and Pearson (1983) and Ives, Olson
p. 335 and Baroudi (1983)

JS: "related positively to user's perceptions"
p. 329

RR Alt: None

Franz, C.R., D. Robey, and R.R. Koeblitz, "User Response to an Online Information System: A Field Experiment," *Management Information Systems Quarterly*, (March 1986), pp. 29-42.

"impact of information systems on user attitudes and perceptions of job characteristics"

CWA: "There seems to be a general consensus that
p. 32 favorable attitudes are associated with
successful implementation."

JS: H1 "... significant impact"
p. 32 H2 "... significant impact"

RR Alt: None

Martin, M.P. and J.E. Trumbley, "Measuring Performance of Automated Systems," *Journal of Systems Management*, (February 1986),, pp. 7-17.

"measuring success of automated systems ... systematic structure for measuring"

CWA: No

JS: "Kucher's key concept here is that of comparison"
p. 14

RR Alt: NA MC

Barki, H., and S.L. Huff, "Change, Attitude to Change and Decision Support System Success," *Information and Management*, Vol. 9, (1995), pp. 261-268.

relationships between the extent of changes caused by the systems to users' work environments and the users' attitudes towards work related changes

concludes DSS users are more satisfied with and use more extensively those DSS that bring change than those that do not

CWA: "To measure system success, researchers have
p. 262 mainly relied on either of two proxies: user satisfaction or system use"

JS: "The present study was conducted to develop
p. 262 empirical evidence concerning ... DSS success"

"User satisfaction is a more appropriate proxy
[for measuring system success]"

RR Alt: Yes
p. 262

Hogue, J.T., and H.J. Watson, "An Examination of Decision-Makers' Utilization of Decision Support System Output," *Information & Management*, Vol. 8, No. 4, (August 1985), pp. 205-212.

Examines DSS contribution to decision making process

Dss users are highly satisfied with their systems

CWA: No

JS: "... the evaluation of user satisfaction, or the
p. 211 measurement of the value or success of the DSS"

RR Alt: NA

Srinivasan, A., "Alternative Measures of System Effectiveness: Associations and Implications," *Management Information Systems Quarterly*, Vol. 9, No. 3, (September 1985), pp. 243-253.

Reexamines the relationship between user perceived effectiveness measures (user satisfaction) and behavioral measures (use)

no positive association found, contrary to much of existing MIS research

CWA: "While acknowledging the importance of economic
p. 243 analysis of MIS value, researchers responded to the shifting emphasis from efficiency to user effectiveness by focusing either on MIS usage or user perceived effectiveness [satisfaction]. Much of the MIS literature of late uses one of the other."

JS: "Measuring and Improving Information System
p. 243 Effectiveness/Productivity ... Approaches that have been advocated include ... user satisfaction"

RR Alt: Yes

Baily, J.E., and S.W. Pearson, "Development of A Tool for Measuring and Analyzing Computer User Satisfaction," *Management Science*, Vol. 29, No. 5, (May 1983), pp. 530-545.

tool for measuring and analyzing computer user satisfaction

CWA: "It is well recognized that productivity ...
p. 530 Further it is argued that utilization is directly connected too the user communities' sense of satisfaction ..."

JS: "it has been argued that user satisfaction is
p. 530 correlated to information system utilization and system success"

RR Alt: None

Ives, B., M.H. Olson, and J.J. Baroudi, "The Measurement of User Information Satisfaction," *Comm of ACM*, Vol. 26, No. 10, (October 1983), pp. 785-793.

Produces a short form measure of user satisfaction

CWA: "Satisfaction of users with their information systems is a potentially measurable, and generally acceptable, surrogate for utility in decision making."
p. 785

JS: "MIS provides a meaningful 'surrogate' for the critical but unmeasurable result of an information system, namely, changes in organizational effectiveness."
p. 785

RR Alt: Yes
p. 785

King, W..R., and B.J. Epstein, "Assessing Information System Value: An Experimental Study," *Decision Sciences*, Vol. 14, No. 1, (January 1983), pp. 34-45.

manager assessments of the importance of a Hubritis are used to assess information system value.

CWA: No

JS: "We want to determine whether practicing managers' overall evaluations of 'total systems' are consistent with those that would be derived from linear models that incorporate the managers' evaluations in terms of information attributes."
p. 34

RR Alt: NA

Mahmood, M.A., "Development and Validation of a Tool for Measuring and Analyzing Decision Support Systems User Satisfaction," pp. 171-173.

user satisfaction is a measure for DSS

CWA: "User satisfaction is a good measure of system effectiveness. Furthermore, it is argued that use of a system is directly related to the user communities' sense of satisfaction. Measuring and analyzing user satisfaction has been of great interest ever since the dawn of the computer era."
p. 171

JS: "user satisfaction is a good measure of system effectiveness"
p. 171

RR Alt: None

Epstein, B.J., and W.R. King, "An Experimental Study of the Value of Information," *Omega*, Vol. 10, No. 3, (1982), pp. 249-258.

multidimensional attribute approach to assess the value of information

CWA: No

JS: "predictions of total system evaluations were made on the basis of self-explicated attribute levels and weightings. These predictions were then compared with the actual overall system assessments that were made by the respondents."
p. 255

RR Alt: None

Ginzberg, M.J., "Finding an Adequate Measure of OR/MS Effectiveness," *Interfaces*, Vol. 8, No. 4, (August 1978), pp. 59-62.

user expectations as predictors of project success or failure

CWA: "The method for measuring ... success .. the
p. 467 literature has suggested both attitudinal (eg. user satisfaction) ..."

JS: "There are basis in the literature on MIS
p. 463 implementation and in other fields to support the contention that expectations formed early in an MIS development project should be related to the eventual success or failure of that project."

RR Alt: None

Hamilton, S., and N.L. Chervany, "Evaluating Information System Effectiveness - Part I: Comparing Evaluation Approaches," *Management Information Systems Quarterly*, (September 1981), pp. 55-69.

compares evaluator (user, MIS development, internal audit, and top management personnel) viewpoints on system effectiveness

CWA: "User satisfaction with the MIS ... provides the
p. 79 most useful assessment of system effectiveness. Substantial evidence supports the validity ..."

JS: "the use of a standardized validated instrument
p. 84 to measure system success"

RR Alt: None

Larcker, D.F., and P.V. Lessig, "Perceived Usefulness of Information: A Psychometric Examination," *Decision Sciences*, Vol. 11, No. 1, (January 1980), pp. 121-134.

Instrument for measuring perceived usefulness

CWA: "... the ability of MIS designers to specify
p. 121 information that is perceived as useful by
managers is instrumental to the success (or
failure) of the system"

JS: (see CWA above)
p. 121

RR Alt: None

Deese, D.R., "Experiences Measuring User Satisfaction,"
Proceedings of the Computer Measurement Group of ACM,
Dallas, (December 1979), pp. 59-66.

Employs Pearson's user satisfaction tool to
supplement information on FEDSIM review of data
processing installations

CWA: NA

JS: "to supplement information ..."
p. 59

RR Alt: NA

Neumann, S., and E. Segev, "A Case Study of User Evaluation
of Information Characteristics for Systems Improvement,"
Information & Management, Vol. 2, (1979), pp. 271-278.

Questionnaire used to evaluate information system

CWA: No
p. 35

JS: "In addition to the relative contribution of
p. 35 information systems ..."

RR Alt: No

Robey, D., "User Attitudes and Management Information System Use," *Academy of Management Journal*, Vol. 22, No. 3, (September 1979), pp. 527-538.

attitudes are positively related to use

CWA: No

JS: "The primary objective of this research was to
p. 533 relate the objective measures of system use to
attitudes."
p. 537 "Strong positive relationships have been
demonstrated between specific user attitudes and
actual use of an MIS. It does not necessarily
follow, however, that attitudes cause behavior."

RR Alt: None

King, W.R. and J.I. Rodriguez, "Evaluating Management Information Systems," *Management Information Systems Quarterly*, Vol. 2, No. 3, (September 1978), pp. 43-51.

multiple criteria framework for evaluating MIS

CWA: No

JS: "These form broad areas of value assessments -
p. 45 attitudes, value perceptions, information usage
and decision performance - may be measured at
various stages of the design and development
process to evaluate the MIS."

RR Alt: NA

Lucas, H.C., Jr., "Application and Implementation/Unsuccessful Implementation: The Case of a Computer-Based Order Entry System," *Decision Sciences*, Vol. 9, No. 1, (January 1978), pp. 68-79.

"Successful implementation would be affected by the quality of service and the personal costs and benefits to the users"

CWA: No

JS: "Satisfaction, the indicator of successful
p. 72 implementation."

RR Alt: Yes
p. 69

Robey, D., and R.L. Zeller, "Factors Affecting the Success and Failure of an Information System for Product Quality," *Interfaces*, Vol. 8, No. 3, (February 1978), pp. 70-75.

analyze the adoption and rejection of the same
information system by two similar departments of the
same company

CWA: No

JS: "Responses show the user's perception of how
p. 71 favorable the system is for each area of concern.
Questionnaire data can thus provide evidence of
specific user problems."
p. 73 "while we cannot say that attitudes were the
cause of behavior..."

Dickson, G.W., J.A. Senn and N.L. Chervany, "Research in Management Information Systems: The Minnesota Experiments," *Management Science*, Vol. 23, No. 9, (May 1977), pp. 913-923.

"The Minnesota Experiments ... examine the significance of various information system characteristics on decision activity."

CWA: NA

JS: "In addition to discussion quality, measures of
p. 917 user evaluation of the information systems used were taken ..."

RR Alt: NA

Edstrom, A., "User Influence and the Success of MIS Project: A Contingency Approach," *Human Relations*, Vol. 30, No. 7, (1977), pp. 589-607.

"investigate alternative specifications of the relationship between user influence and the success of the management information systems"

Outcome variables: Perceived success (i.e., user satisfaction)

CWA: "The perceived success of an information
system
p. 590 is, however, not the only possible criterion of success and it seems to us to be useful to investigate alternative aspects of success."

JS: "the measures of outcomes [success] are
p. 589 perceptual measures ..."

RR Alt: None

Schewe, C.D., "The Management Information user: An Exploratory Behavioral Analysis," *Academy of Management Journal*, Vol. 19, No. 4, (December 1976), pp. 577-590.

"Model exploring the relationships between management information system users' perceptions of their computer system, perceived variables exogenous to the system, attitudes and system usage."

CWA: No

JS: "According to the model, the beliefs about
p. 579 characteristics of the MIS are evaluated and result in some feeling of favorableness or unfavorableness about the information system."

RR Alt: None

Gallagher, C.A., "Perceptions of the Value of a Management Information System," *Academy of Management Journal*, Vol. 17, No. 1, (March 1974), pp. 45-55.

A method of determining the monetary value of an existing MIS report is based on user perceptions and the semantic differential technique

CWA: No

JS: "it seems fair to conclude that the EAB system
p. 55 2 was well thought of ... as a whole"

RR Alt: Yes
pp. 46, 47

Lucas, H.C., Jr., "Performance and The Use of an Information System," *Management Science*, Vol. 21, No. 8, (April 1975a), pp. 908-919.

A study of user reactions, the use of information systems and an independent rating of systems quality.

CWA: No

JS: H1: "Favorable user attitudes are associated with
p. 207 favorable user perceptions of systems quality and independent ratings of systems quality."

RR Alt: NA

Swanson, E.B., "Management Information Systems: Appreciation and Involvement," *Management Science*, Vol. 21, No. 2, (October 1974), pp. 178-188.

measurement of involvement and appreciation

CWA: No

JS: "An increase in MIS appreciation of an individual
p. 1180 will increase his inquiry involvement."

RR Alt: No

Powers, R.F., and G.W. Dickson, "MIS Project Management: Myths, Opinions and Reality," *California Management Review*, Vol. 15, No. 3, (1973), pp. 147-156.

Research to identify "the correlates of MIS project success"

CWA: No

JS: "user satisfaction - attitudes of the managers
p. 150 receiving project products relative to how well their information needs were being satisfied."

RR Alt: NA

APPENDIX E. TABLES OF FINDINGS

TABLE I. STUDIES MAKING THE CWA

Author	Year
Barki	90
Conrath/Mignen	90
Hufnagel	90
Barooudi/Orlinkowski	88
Guimaraes/Gupta	88
Tati/Vessey	88
Miller/Doyle	87
Baroudi/Olson/Ives	86
Franz/Robey	86
Franz/Robey/Koeblitz	86
Barki/Huff	85
Srivinason	85
Bailey/Pearson	83
Ives/Olson/Baroudi	83
Mahmood	83
Ginzberg	81
Hamilton/Chervany	81
Larker/Vessig	80

TABLE II. BREAKDOWN OF THE CWA

All Yrs	18/40	45%
'83+	15/23	65%
'77+	18/35	51%

TABLE III. STUDIES WITH JUSTIFICATION SUPPORTED

AUTHOR	YEAR	CWA
Conrath/Mignen	90	Y
Hufnagel	90	Y
Evans, et al.	88	NA (MC)
Gallupe/DeSanctis	88	NA (MC)
Aldag/Power	86	NA (MC)
Baroudi/Olson/Ives	86	Y
Franz/Robey	86	Y
Franz/Robey/Koeblitz	86	Y
Martin/Trumbley	86	NA (MC)
Srinivason	85	Y
Bailey/Pearson	83	Y
Ives/Olson/Baroudi	83	Y
King/Epstein	83	N
Deese	79	NA (FEDSIM)
Nueman/Segev	79	N
Robey	79	N
King/Rodriguez	778	N
Robey/Zellar	78	N
Dickson/Senn/Chervany	77	NA (MC)
Schewe	76	N
Gallagher	74	N
Lucas	74	N
Swanson	74	N
Powers/Dickson	73	N

TABLE IV. BREAKDOWN OF JUSTIFICATION SUPPORTED

All Yrs.	24/40	60%	'83+	13/23	57%
+CWA	8/18	44%			
'83+	8/13	62%			
'77+	8/18	44%			

**TABLE V. STUDIES CITING A REFERENCE REJECTING ALTERNATIVES
(RR Alt)**

AUTHOR	YEAR	CWA
Doll/Torkzadeh	88	N
Barki/Huff	85	Y
Srinivason	85	Y
Ives/Olson/Baroudi	83	Y
Lucas	78	N
Gallagher	74	N

TABLE VI. BREAKDOWN OF RR ALT

All Yrs	6/32	19%
+CWA	3/18	17%
'83+	3/13	23%
'77+	3/18	17%

TABLE VII. NAMES, DEFINITION AND CONSTRUCT OF USER SATISFACTION VARIABLES

STUDY YEAR	VARIABLE: DEFINITION CONSTANT
1. Powers/Dickson '73	user satisfaction: attitudes of managers not described
2. Swanson '74	appreciation: users beliefs about relative value not described
3. Lucas '74	user attitudes: not defined some scale not described
4. Gallagher '74	user perceptions: not defined semantic differential
5. Schewe '76	user perceptions, attitudes: not defined not described
6. Edstrom '77	perceived success: not defined complete success - complete failure
7. Dukson/Senn/Chervany '77	user evaluation: not defined not described
8. Robey/Zeller '78	attitudes: not defined Shultz-Slevin
9. Lucas '78	user perceptions: modified JDI Shultz-Slevin
10. King/Rodriguez '78	value perceptions: "direct assessment" of MIS Shultz-Slevin
11. Robey '79	user attitudes: not defined Shultz-Slevin
12. Neumann/Segev '79	user evaluation: accuracy, content, frequency, recency questionnaire
13. Deese '79	user satisfaction: * Pearson method
14. Larkin/Lessig '80	perceived useableness/perceived importance questionnaire - 7 pt scale
15. Hamilton/Chervany '81	user satisfaction: * Pearson method
16. Ginzberg '81	user satisfaction Shultz-Slevin
17. Epstein/King '83	satisfaction/value perception: 10 attributes questionnaire, 5 pt scale
18. Mahmood '83	user satisfaction: * Pearson method
19. King/Epstein '83	satisfaction/value perception: 10 attributes questionnaire, 5 pt scale
20. Ives/Olson/Baroudi '83	user satisfaction: * Pearson, Bailey/Pearson
21. Bailey/Pearson '83	user satisfaction: semantic differential factors 39 Pearson method
22. Srinivasen '85	user satisfaction: * Bailey/Pearson
23. Hogue/Watson '85	perceived value: satisfaction/diissatisfaction questionnaire 7 pt scale

STUDY YEAR	VARIABLE: DEFINITION CONSTANT
24. Barki/Huff '85	user satisfaction: * Pearson Method
25. Martin/Trumbly '86	user accommodation: "rule of satisficing" questionnaire - Likert scales
26. Franz/Robey/Koeblitz '86	user attitudes/perceptions Schultz-Slevin
27. Franz/Robey '86	perceived usefulness: user satisfaction * Bailey and Pearson
28. Baroudi/Olson/Ives '86	user satisfaction: * Bailey and Pearson
29. Aldag/Power '86	user perceptions: multiple item Likert scale
30. Miller/Doyle '87	user satisfaction: * Bailey and Pearson
31. Tart/Vessey '88	user satisfaction: * Bailey and Pearson
32. Gurmaraes/Gupta '88	user satisfaction: * Bailey and Pearson
33. Gallupe/DeSanctis '88	perceived reactions, satisfaction questionnaire, Likert scale
34. Evans, et. al '88	user satisfaction: * Pearson Method
35. Doll/Torkzadeh '88	user satisfaction: * Bailey and Pearson
36. Baroudi/Orlikowski '88	user satisfaction: short form 13 factors * Bailey and Pearson
37. Hufnagel '90	user satisfaction: * Bailey and Pearson
38. Conrath/Mignen '90	user satisfaction: * Bailey and Pearson
39. Burkhard '90	user satisfaction: * Bailey and Pearson short form
40. Barki '90	user satisfaction: * Bailey and Pearson

* see "USER SATISFACTION" in Section III, METHODOLOGY

TABLE VIII. STUDIES WITH VALIDITY/RELIABILITY CHECKS

Hufnagel	' 90
Baroudi/Orlikowski	' 88
Doll/Torkzadeh	' 88
Gurmaraes/Gupta	' 88
Tart/Vessey	' 88
Miller/Doyle	' 87
Bailey/Pearson	' 83
Ives/Olson/Baroudi	' 83
Mahmood	' 83
Larcker/Lessey	' 80

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